

KR8L PC Sound Card to Transceiver Interface Box

General Description

This interface consists of four separate circuits, some of which can be considered optional depending on what functions you wish to provide: (1) Receiver audio input to the PC sound card. If you only want to listen to PSK-31, RTTY, SSTV, etc., this is the only circuit you will need. (2) PC sound card output to the transmitter. (3) Push to Talk (PTT) control circuit for keying the transmitter. (4) Frequency Shift Keying (FSK) circuit. This circuit is needed only if you plan to run radio teletype using true FSK (as opposed to audio FSK -- AFSK) using a program such as MMTTY.

In my implementation of this design the connections to the PC sound card are made through two shielded audio cables terminated in 3.5mm stereo plugs, which are plugged into the sound card input and output jacks. Only one channel (left or right; your option) is used and the other is not connected. The PTT and FSK circuits are connected to the computer's serial (EIA-232) port through a shielded cable terminated in a nine-pin connector. If you do not have a serial port, a USB-to-Serial adapter can be used. Most Ham Radio sound card programs use the serial port's DTR and/or RTS signals to key the transmitter PTT line. MMTTY uses the TXD signal for FSK.

For maximum flexibility my implementation uses a five-pin DIN jack for the transceiver connection. This lets me use a different cable for each transceiver, since each radio has a different type of audio input/output interface. (I use this interface with my QRP rig for PSK-31, with my VHF/UHF rig for WSJT, and with my MF/HF rig for PSK-31, RTTY, SSTV, Olivia, and other digital modes.)

Regarding connections on the transceiver, note that most modern rigs have connections for low-level audio output which is independent of the main audio volume control setting, and also a separate audio input to the modulator that is independent of the microphone gain setting. If you have these connections available, they are the ones you should use.

Circuit Details

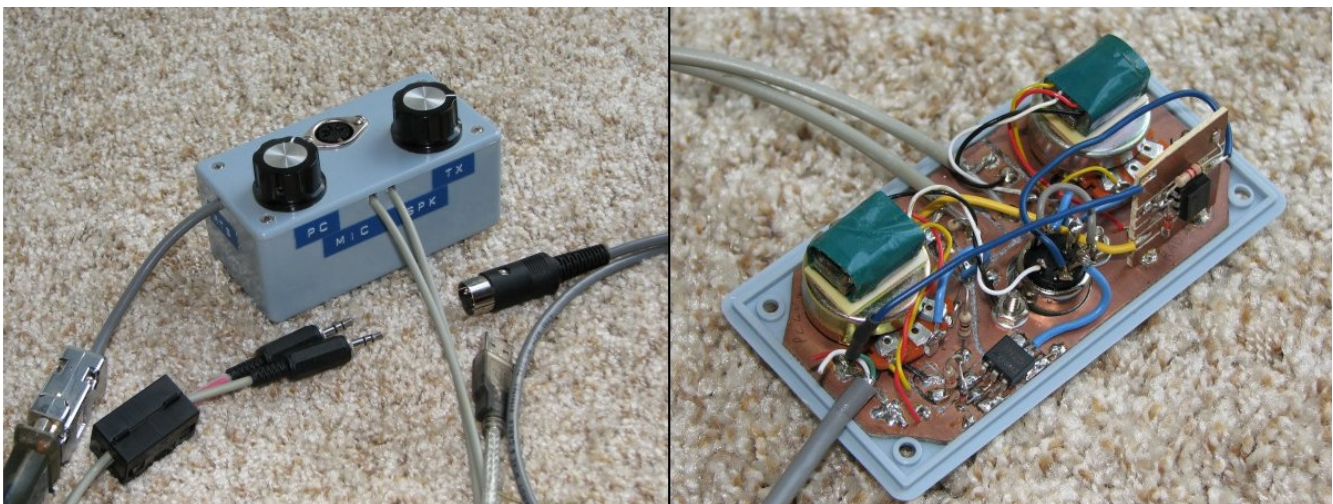
This interface box provides two main functions: (1) complete electrical isolation between the PC and the transceiver, and (2) rapid and easy adjustment of audio levels between the two devices. The circuit can be simplified by omitting the audio level components and using the sound card controls provided by your computer's operating system. However, I find it much simpler to twist a knob than to go through the click-click-slide-click-click process every time I want to adjust levels. (Depending on which program and mode you are using, you may need to adjust levels more often than you might expect to compensate for audio passband response, band conditions, etc. Also, other programs that you use in between your Ham Radio sessions may make changes to your sound card settings that you will need to compensate for.)

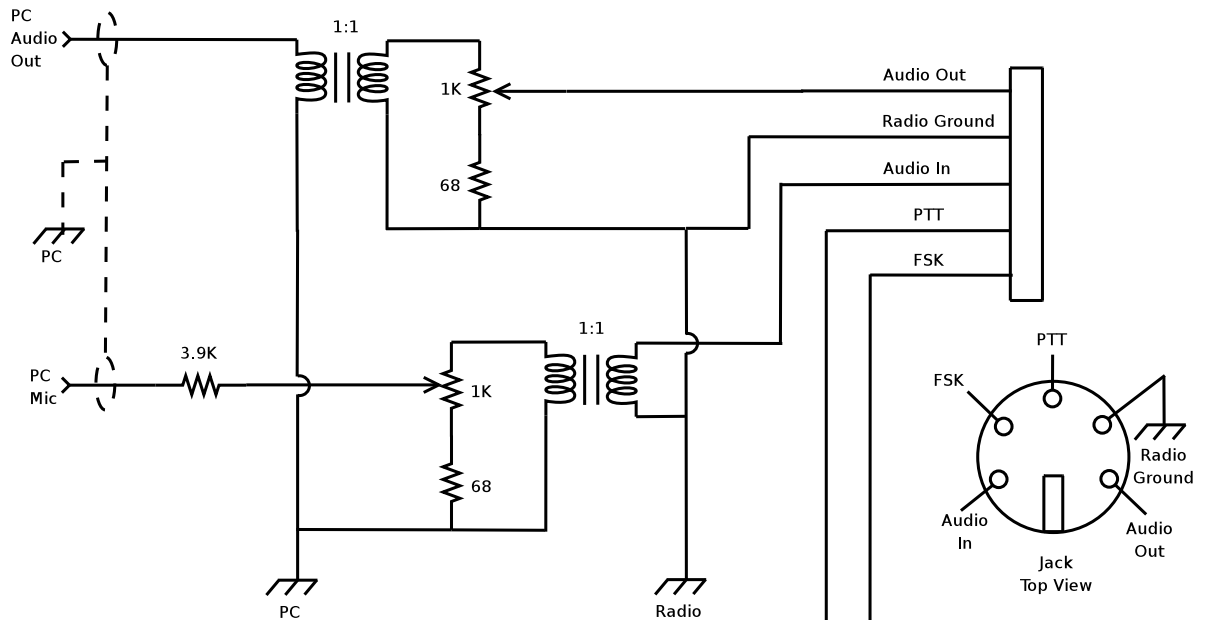
Starting at the top of the schematic, the two audio circuits are almost identical except for the direction of signal flow. The 1-to-1 audio transformers provide DC isolation while permitting audio to pass through. The 1k Ω linear taper potentiometers provide for adjustment of the audio level, and the 68 Ω resistors establish a minimum volume level. My laptop does not have a line-in connection, so I added the 3.9k Ω resistor to adjust the audio from line level to mic level. (Specific values were determined by trial-and-error.)

The PTT and FSK circuits are identical. The heart of each circuit is a 4N25 optoisolator. The 4N25 contains a phototransistor, which is switched into conduction by an infrared light emitting diode. When the appropriate serial port signal goes "high" the LED activates and turns on the transistor, so that the connected circuit (PTT or FSK) is grounded. Because the signal is transferred by infrared light, there is no DC connection across the optoisolator. The 1.2k Ω resistor limits the current through the LED to an appropriate level, and the 1N914 diode provides a return current path for the serial port signal when it is "low."

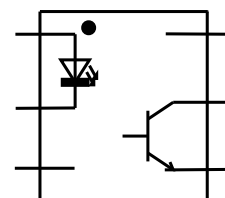
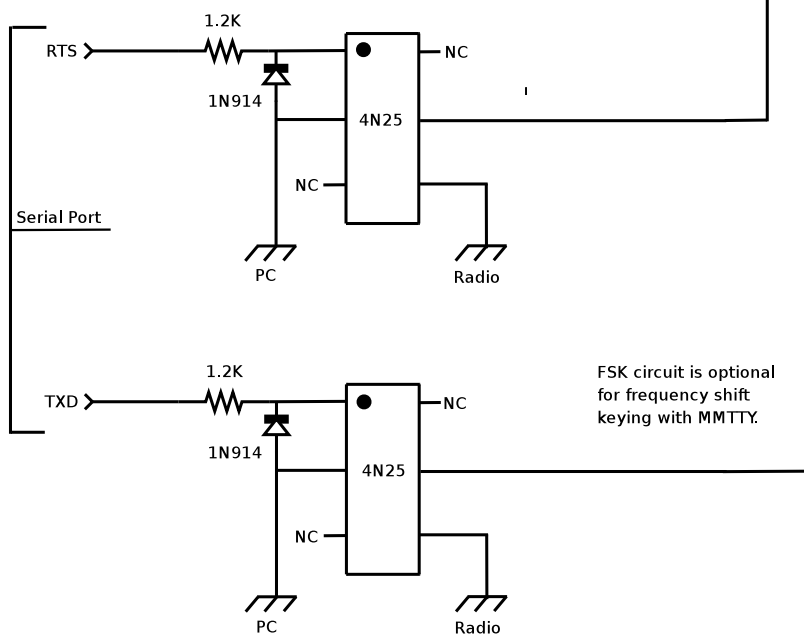
Components for this circuit can probably be obtained from Radio Shack or Hughes Electronics. The audio transformers may be the least easy to find, so I suggest having them on hand before starting to build. Layout is not critical, and can be done on perf board, "dead bug" style, using glued pads, with the hacksaw (or Dremel[®] Tool) method, with a custom etched board, or any other method you choose. Probably the most important part of the layout is to make sure that you provide two separate grounds, one for PC-connected components, and one for radio-connected components. I used double-sided tape to stick the audio transformers to the bottom of the level pots, and attached the circuit board (Dremel[®] method) to the top of the box with the level pots' control nuts.

Once completed, install the circuit in a suitable plastic or metal box. I added a couple of snap-on ferrites to my audio cables as a precaution against RF getting into the sound card and distorting the signal.





Note that PC and Radio grounds are kept separate.



4N25 Optoisolator

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